Write your answers in the answer blank (or circle them). **Show all necessary work for full credit.** Answers are to be exact values unless stated otherwise.

1. Determine the following given: $\mathbf{a} = \mathbf{i} + \mathbf{j} - 2\mathbf{k}$, $\mathbf{b} = 3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$, $\mathbf{c} = \mathbf{j} - 5\mathbf{k}$

(a) $-7\mathbf{a} + 5\mathbf{b}$

1a. _____

(b) $-\mathbf{a} \cdot 2\mathbf{b}$

1b. _____

(c) $\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$

1c. _____

(d) $\text{comp}_{\mathbf{a}}\mathbf{b}$

1d. _____

(e) The angle between $\mathbf{a}$ and $\mathbf{b}$

1e. _____

2. Find the values of x such that the vectors $\langle 3, 2, x \rangle$ and $\langle 2x, 4, x \rangle$ are orthogonal.

3. Determine an equation of the plane through (2,1,0) and parallel to $x + 4y - 3z = 1$

4. Determine if the given lines are parallel, skew, or intersecting.

$L_1:$ $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$

$L_2:$ $\frac{x+1}{6} = \frac{y-3}{-1} = \frac{z+5}{2}$

5. For the given planes: $x + y - z = 1$ and $2x - 3y + 4z = 5$
   (a) Show that the planes are neither parallel nor orthogonal.
   (b) Find the angle between the planes to the nearest degree.

6. Find the distance between the planes $3x + y - 4z = 2$ and $3x + y - 4z = 24$